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EXAMINER	
AKHAVANNIK, HUSSEIN	
ART UNIT	PAPER NUMBER
2621	

DATE MAILED: 11/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/662,172	SHYU, HAW-JYE
	Examiner	Art Unit
	Hussein Akhavannik	2621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 12-23 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 12-23 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 12 October 2004 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendments to the specification overcome the Examiner's objections cited in paragraph 3 of the previous office action.

2. The references included in the response overcome the requirement of an IDS cited in paragraph 4 of the previous office action.

3. The amendment to claim 21 overcomes the 35 U.S.C. § 112 rejection cited in paragraph 6 of the previous office action.

Terminal Disclaimer

4. The terminal disclaimer filed on 10/12/2004 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of U.S. Patent No. 6,724,916 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Drawings

5. The drawings were received on 10/12/2004. These drawings are accepted.

Response to Arguments

6. Applicant's arguments filed 10/12/2004 have been fully considered but they are not persuasive.

The Applicant alleges, on page 16, lines 11-17, that the mere assertion that Kakinami et al discloses multiple cameras and that Yankowich et al discloses that multiple (acoustic) sensors that can be used to track objects is insufficient to support a prima facie case of obviousness to combine the references. The Examiner respectfully disagrees. Kakinami et al and Yankowich et al are both directed towards tracking an object as explained in abstracts of both references. It is

obvious to one of ordinary skill in that art and evidenced by claims 14-18 of the instant application that many types of sensors may be used to collect information about a scene of interest, including the electromagnetic sensors of Kakinami et al and the acoustic sensors of Yankowich et al. Furthermore, by using different types of sensors, the processing (CHT) performed to track an object in Yankowich et al is not altered. Yankowich et al explain on page 5023, first column, first full paragraph that the composite Hough transform is consistent and effective in detecting and initiating target tracks. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a composite Hough transform to determine the track of an object, as suggested by Yankowich et al, in the system of Kakinami et al because the sensors of both system are directed towards tracking objects and the tracking would more consistent and effective.

The Applicant alleges, on page 16, line 18 to page 17, line 2, that there is no guidance in either Kakinami et al or Yankowich et al for using a composite Hough transform to process television image data. The Examiner respectfully disagrees. It is obvious to one of ordinary skill in that art and evidenced by claims 14-18 of the instant application that many types of sensors may be used to collect information about a scene of interest, including the electromagnetic sensors of Kakinami et al or the acoustic sensors of Yankowich et al. Furthermore, by using different types of sensors, the processing (CHT) performed to track an object in Yankowich et al is not altered. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the use a composite Hough transform to determine the track of an object, as suggested by Yankowich et al, in the system of Kakinami et al because the

sensors of both system are directed towards tracking objects and the tracking would more consistent and effective.

The Applicant alleges, on page 17, line 16 to page 18, line 3, that a prima facie case of obviousness has not been established for claim 19. The Examiner respectfully disagrees. The rejection of claim 19 in the previous office action explains that a means for converting the signals received from the sensor arrays to a digital format is an analog-to-digital converter corresponds to claim 12iii. This refers to claim 12iii of the <u>instant</u> application, which recites "an analog/digital converter for converting the signals received from the sensor arrays to digital format." In that rejection, the Applicant is directed towards figure 6, reference number 16c of Kakinami et al, which clearly illustrates an analog-to-digital converter.

The Applicant alleges, on page 19, lines 1-12, that the suggestion in Shyu that the data from multiple sensors may be used to detect objects close to the sensor system is insufficient to support a prima facie case of obviousness. The Examiner respectfully disagrees. The Kakinami et al reference is relied upon to show the explicit use of a data storage device and computer to track objects. A computer and data storage device would be required and inherent in any object tracking system, including Shyu, to allow processing of the input data from the sensors. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a data storage device and computer, as suggested by Kakinami et al, in the system of Shyu because such devices are required to collect object motion data to use in an object tracking system and because Shyu explains that data from multiple sensors, such as the sensors of Kakinami et al, may be used to detect objects close to the sensor system.

The Applicant alleges on page 19, line 16 to page 20, line 13, that the CPU of Kakinami et al could perform the claimed functions of claim 21. The Examiner respectfully disagrees. All CPUs may be programmed to perform any functions that a user requires. The CPU of Kakinami et al in used to determine the track of objects, as explained by Kakinami et al in the abstract. Therefore, it can also be programmed to perform the functions implemented by Shyu. The Examiner also notes that the functions of claim 21 are explicitly explained by Shyu and Kakinami et al is relied on to show only the CPU hardware not explicitly explained by Shyu.

The Applicant alleges, on page 20, lines 14-21, that neither Shyu or Kakinami et al teach accumulating data for the reference track by simultaneously integrating a series of pixel values along the appropriate delay curve in the primary and secondary correlograms. The Examiner respectfully disagrees. Shyu explicitly explains "accumulating evidence for each image feature by summing (integrating) the pixel values along the hypothesized image features and storing the accumulated pixel values in the parameter space" on page 4183, second column, second full paragraph. Furthermore, Shyu et al suggest a multi-sensor (array) system in the abstract. This processing corresponds to the "accumulating data for the reference track" that can be performed on the correlogram for a first and second sensor, corresponding to a primary and secondary correlogram, in a two-sensor system as suggested by Shyu in the abstract.

The Applicant alleges, on page 21, lines 1-11, that neither Shyu nor Kakinami et al teach a computer calculating an associated delay in a secondary correlogram for the secondary array. The Examiner respectfully disagrees. Shyu explicitly explains calculating an associated delay in a primary correlogram for the primary array on page 4183, second column, third paragraph (referring to claim 21iii). Furthermore, Shyu et al suggest a multi-sensor (array) system in the

abstract. Therefore, the same processing performed to calculate the associated delay in a primary correlogram for the primary array would be performed on the data for the secondary array to calculate a secondary correlogram in the multi-sensor system suggested by Shyu.

The Applicant alleges, on page 22, lines 10-19, that computing a delay curve parameters (θ_2, v/D, t_{02}) is not obvious only because the modification "can" be made. The Examiner agrees. However, Shyu explicitly suggests using a multi-sensor system in the abstract. In order to modify the system of Shyu to be a multi-sensor system, the complete processing to track an object can and must be performed on information for each sensor. Therefore, the motivation to computing a delay curve parameters (θ_2, v/D, t_{02}) is explicitly given by Shyu.

The Applicant alleges, on page 22, line 20 to page 23, line 4 that the rejection of claim 22iv is not entirely clear. The rejection of claim 22iv in the previous office action explains that performing integration along the template delay curve in the primary correlogram corresponds to claim 21v. This refers to claim 21v of the <u>instant</u> application, which recites "accumulating (integrating) data for the reference track by simultaneously integrating a series of pixel values along the appropriate delay curve in the primary and secondary correlograms."

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 12-13, 15-16, and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kakinami et al (U.S. Patent No 5,892,855) in view of Yankowich et al

(Yankowich, S.W.; Farooq, M.; A Hough transform based multisensor, multitarget track initiation technique; Decision and Control, 1997, Proceedings of the 36th IEEE Conference on, Volume: 5, 1997 Page(s): 5018 -5023).

Referring to claim 12, which is representative of claim 13,

i. A plurality of arrays for receiving signals from a target is illustrated by Kakinami et al in figure 1a as the first, second, and third camera.

ii. A receiver for receiving signals from the plurality of sensors is illustrated by Kakinami et al in figure 1A as the first, second, and third image processor.

iii. An analog/digital converter for converting the signals received from the sensor arrays to digital format is illustrated by Kakinami et al in figure 6, reference number 16c.

iv. A digital storage device for storing the digitized data is illustrated by Kakinami et al in figure 6, reference number 15a and explained in column 8, lines 46-53.

v. A computer system retrieving the stored digitized data from the plurality of sensor arrays is illustrated by Kakinami et al in figure 6, reference number 11. However, Kakinami et al do not explicitly explain processing the data through the use of a composite Hough transform to determine the track of the target. However, Yankowich et al explain combining sensory data from multiple search scans to detect tracks using the Hough Transform of the composite data on page 5018, first column, third paragraph. Yankowich et al explain that the Hough transform has been proposed as an effective means for achieving target track initiation by combining sensory data from multiple search scans into one multidimensional data map in page 5018, paragraph 3. Furthermore, Yankowich et al illustrate that the Hough transform may be used to track

objects from two sensors in figure 1 on page 5019. It is obvious to one of ordinary skill in that art and evidenced by claims 14-18 of the instant application that many types of sensors may be used to collect information about a scene of interest, including the electromagnetic sensors of Kakinami et al and the acoustic sensors of Yankowich et al. Furthermore, by using different types of sensors, the processing (CHT) performed to track an object in Yankowich et al is not altered. Yankowich et al explain on page 5023, first column, first full paragraph that the composite Hough transform is consistent and effective in detecting and initiating target tracks. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a composite Hough transform to determine the track of an object, as suggested by Yankowich et al, in the system of Kakinami et al because the sensors of both system are directed towards tracking objects and the tracking would more consistent and effective.

Referring to claim 15, the sensors for retrieving data being electromagnetic sensors is illustrated by Kakinami et al in figure 6, reference number 16b as the first camera. This video camera is capable of sensing light, which is electromagnetic energy. Furthermore, Yankowich et al explain using data from radar on page 5021, first column, third paragraph, which can also sense electromagnetic energy. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an electromagnetic sensor because radar is common in the military field.

Referring to claim 16, the sensors for retrieving signals from a target being optical sensors is illustrated by Kakinami et al in figure 6, reference number 16b as the first camera.

Referring to claim 19, the means for converting the signals received from the sensor arrays to a digital format is an analog-to-digital converter corresponds to claim 12iii.

Referring to claim 20, the means for storing the digitized data from the sensor arrays being a computer is explained by Kakinami et al in column 8, lines 60-67.

9. Claims 14 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kakinami et al in view of Yankowich et al, and further in view of Monroe (U.S. Patent No. 5,798,458).

Referring to claim 14, the sensors for receiving signals for a target being acoustic sensors is not explicitly explained by Kakinami et al or Yankowich et al. However, Monroe illustrates a plurality of acoustic sensors in figures 2 and 3, reference numbers 19a to 19m. The tracking system of Yankowich et al can easily be directed towards determining a track of an object underwater, as long as the object motion information is collected. The plurality of acoustic sensors illustrated by Monroe are capable of collecting object motion data under water. Therefore, it would have been an obvious matter of design choice to modify the system of Kakinami et al and Yankowich et al by using an acoustic sensor, since the Applicant has not disclosed that using an acoustic sensor solves any stated problem or is for any particular purpose and it appears that acoustic sensors would perform equally as well as electromagnetic sensors to derive motion information of on object.

Referring to claim 17, the receiver being an acoustic receiver is not explained by Kakinami et al or Yankowich et al. However, Monroe illustrates a multiplexer (96) and Digital Signal Processor (296) in figures 2 and 3 to receive the signals from the acoustic sensors. The tracking system of Yankowich et al can easily be directed towards determining a track of an

object underwater, as long as the object motion information is collected. The plurality of acoustic receivers illustrated by Monroe are capable of collecting object motion data under water. Therefore, it would have been an obvious matter of design choice to modify the system of Kakinami et al and Yankowich et al by using an acoustic receiver, since the Applicant has not disclosed that using an acoustic receiver solves any stated problem or is for any particular purpose and it appears that acoustic receivers would perform equally as well as electromagnetic receivers to derive motion information of on object.

10. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kakinami et al in view of Yankowich et al, and further in view of Holmberg (U.S. Patent No. 5,838,816).

Referring to claim 18, the receiver being a sonar signal receiver is not explicitly explained by either Kakinami et al or Yankowich et al. Yankowich et al so explain using data from radar on page 5021, first column, third paragraph. However, Holmberg illustrate a sonar receiver in figure 2 as reference number 12. The sonar receiver corresponds to the radar receiver of Yankowich et al, except that sonar is used for underwater object motion detection. Therefore, it would have been an obvious matter of design choice to modify the system of Kakinami et al and Yankowich et al by using a sonar signal receiver, since the Applicant has not disclosed that using a sonar signal receiver solves any stated problem or is for any particular purpose and it appears that sonar signal receivers would perform equally as well as electromagnetic receivers to derive motion information of on object.

11. Claims 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shyu (Shyu, Haw-Jye; Applying morphological filters to acoustic broadband correlograms; Systems,

Man, and Cybernetics, 1997. Computational Cybernetics and Simulation., 1997 IEEE International Conference on, Volume: 5, 1997 Page(s): 4182 –4187) in view of Kakinami et al.

Referring to claim 21,

i. A data storage device is not explained by Shyu, but is illustrated by Kakinami et al in figure 6, reference numbers 15a, 12, and 13 as the image memory, RAM, and ROM.

ii. A computer for retrieving data from the data storage device is not explained by Shyu, but is illustrated by Kakinami et al in figure 6, reference number 11 as the CPU. Hypothesizing a reference track relative to a primary sensor array is explained by Shyu on page 4183, second column, second paragraph. Hypothesizing a reference track relative to a second sensor array is not explicitly explained by Shyu, however, Shyu does suggest using a two-sensor system in the abstract. Furthermore, a multi-sensor system illustrated by Kakinami et al in figure 1a maybe used, wherein a reference track would be hypothesized for each sensor array and therefore, a reference track relative to the secondary array would be hypothesized.

iii. Calculating an associated delay in a primary correlogram for the primary array is explained by Shyu on page 4183, second column, third paragraph.

iv. Calculating an associated delay in a secondary correlogram for the secondary array corresponds to claim 21iii, wherein the associated delay curve is calculated for the secondary array in a multi-sensor system suggest by Shyu.

v. Accumulating data for the reference track by simultaneously integrating a series of pixel values along the appropriate delay curve in the primary and secondary correlograms is explained by Shyu on page 4183, second column, second paragraph.

vi. Storing the accumulated pixel values in composite Hough space is explained by Shyu on page 4183, second column, second paragraph. Thresholding the accumulated pixel values to detect the track is explained by Shyu on page 4183, second column, second paragraph.

A computer and data storage device would be required and inherent in any object tracking system, including Shyu, to allow processing of the input data from the sensors. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a data storage device and computer, as suggested by Kakinami et al, in the system of Shyu because such devices are required to collect object motion data to use in an object tracking system and because Shyu explains that data from multiple sensors, such as the sensors of Kakinami et al, may be used to detect objects close to the sensor system.

Referring to claim 22,

i. A data storage device and computer for retrieving data from the storage device correspond to claim 21i-ii.

ii. Hypothesizing a track with track parameter values (θ_1, v, D, t_{01}) is explained by Shyu on page 4183, second column, second paragraph as hypothesizing a group of image features.

iii. Generating a corresponding template delay curve in a primary correlogram corresponds to claim 21iii.

iv. Performing integration along the template delay curve in the primary correlogram corresponds to claim 21v.

v. Computing a delay curve parameters (θ_2, v/D, t_{02}) is explained by Shyu on page 4183, second column, second paragraph as hypothesizing a group of image features, which can be applied to a second sensor.

vi. Generating a corresponding template delay curve in a secondary correlogram based on the delay curve parameters (θ_2, v/D, t_{02}) is explained by Shyu on page 4183, second column, third paragraph. Note that the equation explained does contain v/D and can be used for the data from the secondary array.

vii. Performing integration along the template delay curve in the secondary correlogram corresponds to claim 21v.

viii. Computing a delay curve parameter (θ_{2m}, v/D_{2m}, t_{02m}) for the secondary array based on geometric constraints is explained by Shyu on page 4183, second column, second paragraph as hypothesizing a group of image features. Note that the image features may be based on a series of geometric constraints.

ix. Generating a corresponding template delay curve in a secondary correlogram corresponds to claim 21iv.

x. Combining the integrated values and storing it in the corresponding composite Hough space corresponds to claim 21v-vi.

xi. Thresholding the accumulated pixel values to detect the track corresponds to claim 21vi.

Referring to claim 23,

i. Computing a hypothesis reference track relative to a primary sensor array corresponds to claim 21ii.

ii. Computing a hypothesis reference track relative to a second sensor array corresponds to claim 21ii.

iii. Calculating an associated delay curve in a primary correlogram for the primary sensor array corresponds to claim 21iii.

iv. Calculating an associated delay curve in a secondary correlogram for the secondary sensor array corresponds to claim 21iv.

v. Accumulating data for the reference track by integrating a series of pixel values along the appropriate delay curve in the primary and secondary correlograms corresponds to claim 21v.

vi. Storing the accumulated pixel values in composite Hough space corresponds to claim 21vi.

vi. Thresholding the accumulated pixel values to detect the track corresponds to claim 21vi.

Conclusion

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hussein Akhavannik whose telephone number is (703)306-4049. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo H. Boudreau can be reached on (703)305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hussein Akhavannik H.A.
November 21, 2004

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